

2021 Weather in Review: George Washington Birthplace National Monument

Weather and climate play significant roles in driving both physical and ecological processes. For example, the active processes that shape the North Atlantic coastline are largely the result of meteorological events such as wind-driven waves. For research and long-term ecological monitoring, weather and climate data provide the potential for correlations to be made with observed physical and ecological pattern data. This resource brief provides a summary of both historic and current (2021) weather data for George Washington Birthplace National Monument (GEWA), Virginia (VA). Because tide levels and wind can be significant for coastal parks, the annual water level and wind data are included.

Temperature

Overall, 2021 was the 14th warmest year on record with an average temperature of 58.5°F — 1.8 degrees above average (Table 1). 2021 had the 5th warmest autumn on record at GEWA. The warmest month was August with an average of 78.4 degrees — 2.5 degrees above the monthly average. Seasonally, spring fell within "near normal" temperatures, autumn and summer fell within "above normal" temperatures, and winter fell within "much above normal" temperatures (Figure 1).

Table 1. Westmoreland County, Virginia average monthly, average annual, and departures from long-term average temperatures. Departures from average are based on a comparison of 2021 average temperatures to relevant averages from 1895-2020. Data are available at the NOAA National Centers for Environmental Information, Climate at a Glance: County Time Series website.

Month (2021)	Average temperature (°F)	Departure from long-term average temperature (°F)
January	37.0	+1.2
February	36.7	-0.5
March	49.1	+3.5
April	56.1	+1.0
May	63.3	-1.5
June	74.3	+1.1
July	78.3	+0.7
August	78.4	+2.5
September	71.2	+1.5
October	64.6	+5.9
November	45.4	-2.4
December	47.5	+8.7
Annual	**58.5**	**+1.8**

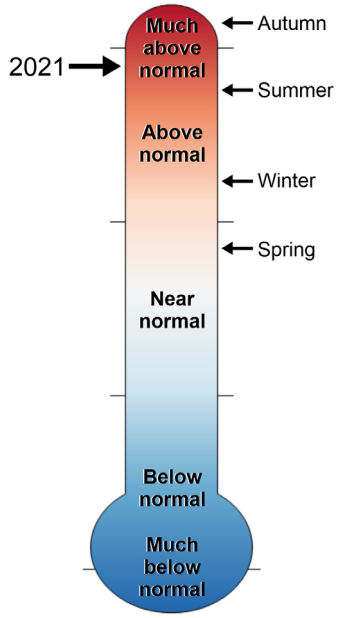


Figure 1. Westmoreland County, Virginia annual and seasonal temperature rankings from 1895-2021. Of the 127 records, 2021 was the 14th warmest year. Seasonally, it was the 38th warmest winter, 52nd warmest spring, 19th warmest summer, and the 5th warmest autumn. Data are available at the NOAA National Centers for Environmental Information, Climate at a Glance: County Time Series website.

Precipitation

Overall, 2021 was the 60th driest year on record with a total of 41.86 inches of precipitation (Table 2). Five months had less than average precipitation amounts. August had the greatest amount of precipitation in 2021 at 5.55 inches — 1.24 inches over the average. November had the lowest amount at 0.98 inches — 2.28 inches below average. Seasonally, autumn fell within "much below normal" levels, winter fell within "near normal" levels, while summer and spring reached "above normal" levels (Figure 2).

Table 2. Westmoreland County, Virginia monthly and annual total precipitation and departures from long-term average totals. Departures from average are based on a comparison of 2021 precipitation levels to relevant averages from 1895-2020. Data are available at the NOAA National Centers for Environmental Information, Climate at a Glance: County Time Series website.

Month (2021)	Total precipitation (in)	Departure from long-term average precipitation (in)
January	2.47	-0.76
February	3.56	+0.62
March	4.09	+0.40
April	2.78	-0.53
May	3.93	+0.17
June	5.40	+1.42
July	5.30	+0.74
August	5.55	+1.24
September	3.42	-0.20
October	3.74	+0.46
November	0.64	-2.26
December	0.98	-2.28
Annual	**41.86**	**-0.98**

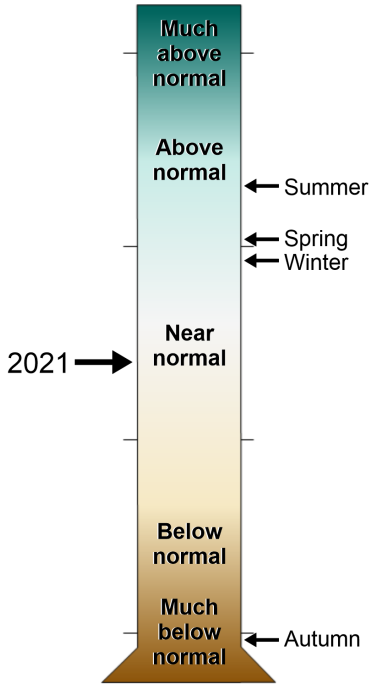


Figure 2. Westmoreland County, Virginia annual and seasonal precipitation rankings from 1895-2021. Of the 127 records, 2021 was the 60th driest year. Seasonally, it was the 40th wettest winter, 45th driest spring, 35th wettest summer, and 8th driest autumn. Data are available at the NOAA National Centers for Environmental Information, Climate at a Glance: County Time Series website.



Temperature and Precipitation Trends (1895–2021)

Temperature and precipitation data are gathered from the U.S. Climate Divisional Database, which stores data from January 1895 to the present, and can be accessed via National Oceanic and Atmospheric Administration's (NOAA) National Centers for Environmental Information (NCEI) website (Figure 3).

Users can choose different geographic scales (i.e., global, national, statewide), different temporal scales, and display them in various types of graphical formats. Temperature and precipitation data presented in this brief are for Westmoreland County, VA.

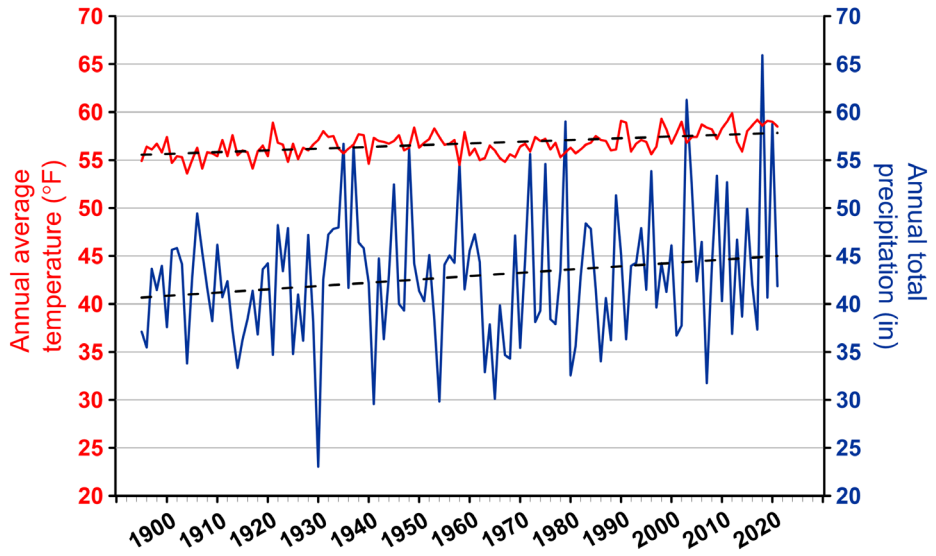


Figure 3. Westmoreland County, Virginia yearly average temperature and precipitation levels from 1895 to 2021. Dashed lines represent the 1895-2021 trend for each parameter; +0.2°F/decade increase for temperature and +0.34 in/decade increase for precipitation. Data are available at the NOAA National Centers for Environmental Information, Climate at a Glance: County Time Series website.

Tide Levels

Water level data is collected from the NOAA National Water Level Observation Network (NWLON) station 8635027 in Upper Machodoc Creek, Virginia. Located at Dahlgren, this station has records dating back to 1970.

The data is graphed to show the difference in the predicted tide level verses what was observed (Figure 4). The offsets in height reflect the effect from storm surge on the normal, astronomically driven tide level.

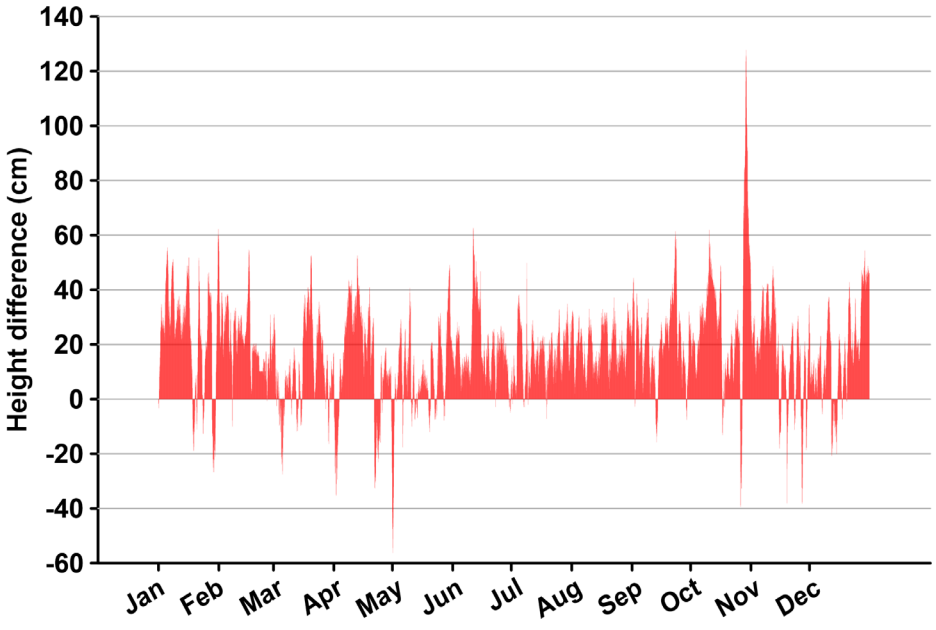


Figure 4. The difference in the predicted and observed tide levels at the NOAA NWLON station 8635027 at Dahlgren, Virginia during 2021. Data available at the NOAA Tides & Currents website.

Wind

Wind data is also collected from the NOAA NWLON station 8635027 at Dahlgren, VA. Each direction is divided into categories called bins that are color coated to represent the frequency of a certain wind speed. The length of the bin represents the number of times wind comes from a given direction as well as the speed of the wind. The longer the length of the bin, the more frequent the given speed was recorded (Figure 5).

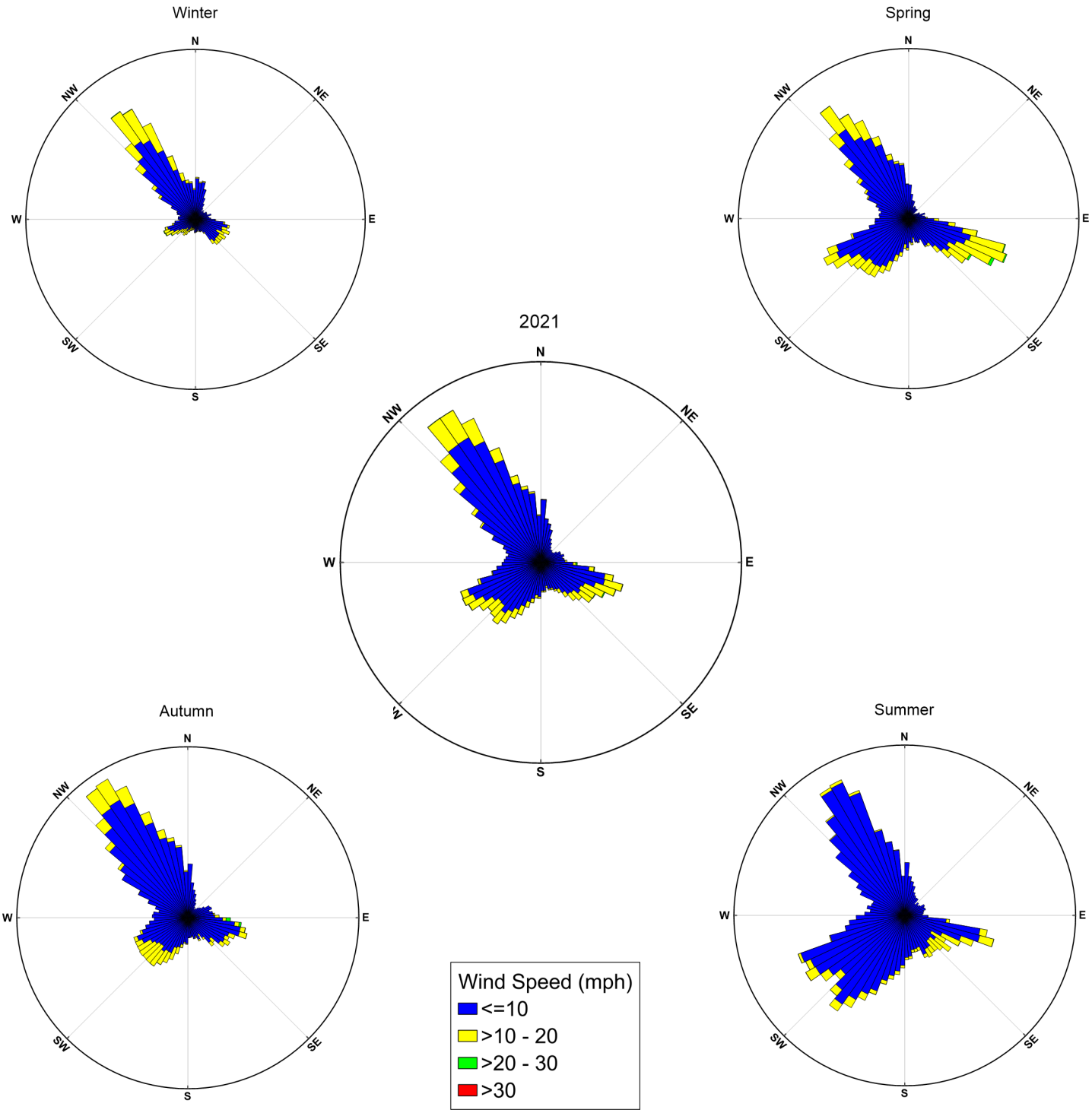


Figure 5. Wind charts reflecting both the seasonal and annual wind direction and speed at the NOAA NWLON station 8635027 at Dahlgren, Virginia during 2021. Each direction is divided into categories called bins that are color coated to represent the frequency of a certain wind speed. The length of the bin represents the number of times wind comes from a given direction as well as the speed of the wind. The longer the length of the bin, the more frequent the given speed was recorded Data available at the NOAA Tides & Currents website.

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